Financial Inclusion and Alternate Credit Scoring for the Millennials: Role of Big Data and Machine Learning in Fintech

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March 30, 2020

A recent survey in the US showed that almost half of the millennials in the US feel that their credit score is holding them back[1].Younger people suffer from shorter credit history and hence are often denied credit by traditional financial institutions or are charged prohibitively high interest rates, which limits their access to credit[2]. This, in turn, exacerbates the evaluation of their creditworthiness by limiting their ability to build a good credit history. Many such individuals may actually be 'good borrowers' if their 'creditworthiness' could be evaluated using alternate data. The problem of lack of credit history for the millennials is a world-wide phenomenon and especially true for developing countries. For example, according to a recent industry report, 156 million Indians who comprise the 'urban mass' representing an annual income of USD 3000 and above have the potential of mass adoption of consumer credit. Of this 'urban mass', approximately 129 million have been mostly deprived of credit due to a lack of credit history.

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[1]Wall Street Journal Blog [Accessed on 17th October, 2019]. According to Wall Street Journal and Transunion; Around 53 million consumers are not scoreable due to lack of information at the three major credit bureaus, and this population is heavily skewed towards those under 35.

[2]2MarketWatch News Article [Accessed on 14th March, 2019].The survey looked into the credit experience of 2,000 Americans ages 18 to 34, and found that many young adults are suffering the consequences of bad credit. In fact, 24 percent of those surveyed said they never learned how to build good credit in the first place, and 15 percent reported that their level of debt is unmanageable, with 1 in 5 admitting that they don't have control over their finances.

This led to the quest for alternative data for credit scoring for the millennials. While millions across India and the world have never obtained a bank loan, they are active mobile phone users who shop online, and have a good social media presence. These traces of unstructured data that individuals leave through their online behavior and mobile phone usage can potentially be used to predict their loan behavior. Consistent with this idea, a plethora of fintech firms have mushroomed all around the world that aim to service such customers by leveraging unstructured data and big data analytics to predict their default behavior. However, thus far, there is limited evidence on whether or not "mobile footprint" of an individual can substitute for traditional credit bureau scores. In this paper, we examine whether an individual's online behavior captured from their mobile phones can be used to predict their likelihood of default.

We use data from one of the largest Fintech lending firms in India to examine the discriminatory ability of mobile footprint variables in predicting loan outcomes. Specifically, we want to understand whether and how the mobile footprint is associated with loan level outcomes such as the likelihood of loan approval and the likelihood of default. More importantly, we want to understand whether these variables can be used to predict the likelihood of default for a borrower without any credit history and, consequently, a credit bureau score.

A natural follow-up question is whether we can use the social and mobile footprint variables to come up with an alternate credit scores for borrowers who do not have traditional credit bureau scores. How many of the borrowers who are denied loans could potentially be creditworthy if their creditworthiness could be evaluated using information from their social and mobile footprints? Importantly, how would granting loans to such borrowers affect the overall default rate of the lender's loan portfolio? These counterfactual questions have significant policy implications. Importantly these questions pertain to default prediction and are not causal in nature. We use a novel machine learning procedure in addressing the policy counterfactual questions posed above.

We obtain the universe of loan applications made to one of the largest fintech lender in India, between the period of February 2016 to November 2018. Unlike prior studies, we also have access to loan applications that were denied allowing us to examine the determinants of loan approval.

Out of about 417,000 loan applications in our sample, about 272,000 were approved while rest were denied. The lender is a stereotypical mobile-only fintech lending platform

targeted towards meeting the short-term credit needs of the salaried millennial. It grants loans ranging from a minimum of INR 10,000 to a maximum of INR 200,000 for 15, 30, 90, 120, and maximum loan duration of 180 days.

To apply for a loan, an individual need to log on to the mobile application and submit regulation mandated identification and address documents, along with bank statements, and salary slip. The potential borrower authorizes the lender to use its digital mobile presence for the evaluation of her creditworthiness and research. They also provide the fintech lender data on their traditional credit score: CIBIL-Transunion credit score (if available), education, and job designation. Importantly for our study, the lender also collects detailed digital information from the individuals' mobile phone such as the mode of login (for example, Facebook and Linkedin), the various applications installed, number of calls, number of contacts on phone, number of social connections, and the kind of mobile operating system such as IOS and Android. We have access to detailed anonymized data on the kind of mobile applications that an individual uses that we club into 6 broad categories: Sales apps which includes applications for e-commerce such as Amazon, Flipkart, Snapdeal among others, Social Network apps such as Whatsapp, Twitter, Messenger services, Financial Apps such as Mobile banking and stock trading applications, Travel apps such as Airbnb, Tripadvisor, and MakeMyTrip, Mloan app which includes other mobile-based lending platforms, and Dating apps such as Tinder.

In addition, we have detailed information on call logs of individuals. For ease of reference, we categorize this digital information captured from an individual's mobile phone into three categories: (1) "social footprint" which refers to the presence of social apps, the preferred social network for logging on to the fintech lender's app, number of contacts, number of calls/sms, whether the customer was acquired through a referral (2) "deep social footprint" which captures information obtained from call logs pattern, and (3) broader "mobile footprint" which refers to the kind of applications installed, the number of applications, and the type of mobile operating system.

This kind of deep digital information on the number of social connections or kind of applications that a customer uses can potentially proxy for otherwise hard to quantify and unobservable aspects of individual behavior that is unavailable to traditional banks.

We begin by analyzing whether and how the customer characteristics, mobile footprint, and social footprint relates to loan approval decisions. As one would expect, we find that a

loan applicant with a higher credit score, salary, and education is more likely to get approved. Importantly, we find that larger is the mobile and social footprint of an individual, the higher is her likelihood of loan approval. Specifically, we find that the number of contacts, the number of apps installed, the number of calls made or received, and the presence of financial and mobile loan apps are positively associated with the loan approval. The discriminatory ability of various aspects of mobile footprints is robust to controlling for the credit bureau scores, customer's earnings, age, education, and location. This suggests that mobile footprint variables provide incremental information that is important for predicting loan outcomes beyond what is captured in the credit score.

Next, we examine the ability of mobile and social footprint variables in predicting defaults. Here, we rely on both the economic and statistical significance of individual explanatory variables as well as Area Under the Curve (AUC) - an easy and commonly used measure of the predictive power of credit scores. The area under the curve is used as a measure of the goodness of a prediction. It measures the proportion of true positives in a prediction. Higher the AUC, the higher is the prediction accuracy We first note that the AUC of the model using only the credit score for predicting defaults is 59%.

This suggests that the discriminatory ability of the credit score in predicting defaults is likely to vary across geographies and intermediaries. To the extent that mobile footprint variables complement the information content of credit score, the marginal value of such information is higher in contexts where the credit score itself has lower discriminatory power. Thus, fintech firms that rely on the mobile footprint for screening borrowers maybe even more important to expand credit access in countries with weak information environments and lower levels of financial inclusion.

The AUC of a model that relies exclusively on the mobile and social footprint to predict defaults at 60.4% is approximately 2% more than the AUC of the model using only the credit score. Our results suggest that mobile and social footprint variables may be capturing hard to quantify aspects of individuals' behavior, which has implications for the likelihood of default. For instance, customers without a financial application installed on their phones are about one and a half times more likely to default relative to those who have such an application installed. This is consistent with the idea that installing financial applications may proxy for the financial sophistication of a customer. In contrast, those with a dating application (any other social network app) are 30% (38%) more likely to default. Interestingly, customers

who log in to the application via Linked or Facebook are 24% and 9% more likely to default respectively relative to those who log-in via other means.

These results hold after controlling for customer's salary, age, and education. This is important because if mobile footprint only proxies for easily measurable financial or customer characteristics, then fintech lending firms should directly collect data on those characteristics rather than trying to infer it from the mobile footprint variables. Indeed such digital information holds more promise if it captures some soft or hard information that would be otherwise difficult to measure or verify. In such a case, mobile and social footprints can be used to improve traditional credit scoring models.

Our results suggest that mobile and social footprint captures an unobservable aspect of individuals which is not fully absorbed by earnings, education, or credit score. Importantly, the AUC of this specification is 61% , two percentage points higher than the AUC of the model using only the credit bureau score and seven percentage points higher than the model, which includes only customer characteristics. In other words, a predictive model that includes customer characteristics, social and mobile footprint performs better in predicting defaults as a model, which includes credit bureau score, and customer characteristics. Overall, these findings suggest that mobile and social footprint variables complement the credit bureau score and observable customer characteristics.

Further, we can use digital information to build credit scoring models for and make loans to individuals without credit or financial history, thereby expanding credit access. To strengthen the evidence in favor of this thesis, we examine the predictive ability of mobile and social footprint in predicting defaults for the set of customers without a credit score or history. The AUC of the mobile footprint model for this sample is 58% and comparable to the predictive performance of the credit bureau score in the primary sample for customers with a credit bureau score.

Our analysis of default prediction thus far was based on measures of mobile and social footprint such as the nature of apps installed, the number of apps installed, the number of calls, etc., to predict defaults. We now seek to understand whether we can use "deep social footprint" of customers from their call logs to improve upon the default prediction. Using various proxies based on the frequency and duration of daily incoming, outgoing, and missed calls that attempt to capture the breadth and strength of an individual's social capital, we find that these measures are strongly correlated with the likelihood of default. Specifically,

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we find that defaulters are more likely to have their call concentrated over a smaller number of individuals. Consistent with this, defaulters seem to have stronger ties with individuals in their contact list as measured by the average number of calls and duration of calls per person. Delinquent customers have a smaller duration of incoming calls but have a higher duration of outgoing calls, which along with their frequency of missed calls, suggests that defaulters are less likely to respond to calls initiated by others.

Most importantly, the AUC of a model that includes call log measures along with other mobile and social footprint variables is 66%, an 8% improvement over the model with credit score alone.

We also have access to the detailed financial reports for a random subset of the borrowers in our sample. The report provides detailed financial information like the borrower's spending and income patterns, number of transactions, other borrowing information, etc., over the last three months, which we collectively refer to as 'deep financial information'.The fintech lender accessed these reports during the loan application process. We find that for the subset of the borrowers for whom we have access to this financial report, the 'deep' mobile footprint has greater predictive power for borrower's credit risk relative to the 'deep' financial information.

We next verify the predictive performance of social and mobile footprint variables using different machine learning algorithms. The problem at hand is to train the algorithms on the sample data to predict defaults "out-of-sample". Standard estimation approaches, where we use all the data to make in sample prediction, is not well suited for such analysis. The in-sample estimation approaches works on being unbiased (having the bias close to zero), thus leaving only the variance to be optimized to minimize the out of sample prediction error. Thus, standard estimation approaches does not offer joint optimality of bias and variance. Machine learning techniques are particularly useful here, which minimizes the mean squares error of the prediction by a joint minimization procedure cognizant of the bias-variance trade-off. Using various machine learning algorithms, we first show that the mobile and social footprints have significantly higher predictive power for both borrowers with and without traditional credit scores.

Next, we run a horse race between 'deep' financial information and 'deep' social footprint variables based on call logs to see if the deep mobile footprint has incremental predictive power beyond what is captured in the borrower's income and spending patterns. This is important as it can inform us regarding the nature of data that should be collected to build

alternate credit scores. First, we find that both 'deep' financial information and 'deep' mobile footprint variables have significant discriminatory ability in predicting defaults. Second, the information content of deep mobile footprint complements and exceeds the 'deep' financial variables. Specifically, the out of sample AUC of the models which includes only deep mobile footprint variable (deep financial information) is 74% (59%). Overall, we find that digital mobile footprint has significant ability in predicting defaults and the information content of these variables complements rather than substitutes for both the credit bureau score and detailed financial information regarding a customer's income and expenses.

The prediction of default risk for borrowers without a traditional credit score is useful and can be used to ask counterfactual questions such as: how many denied borrowers (perhaps due to lack of traditional credit score) would have been approved had we used the social and mobile footprint based alternate credit scores? What would have been the impact on default if we had used these scores? These counterfactual prediction policy questions are not causal in nature, as our objective is to find the best predictor of default risk of the borrower. Using our methodology, we find that even if we use a low predicted default threshold of 10% (1%) for the probability of default relative to the in-sample default rate of 12% for approving loans, about 42% (22%) borrowers who were denied credit would have been granted loans.

Overall, our study documents that mobile and social footprint variables have significant discriminatory power in both loan approvals and default prediction. Importantly, with the use of big data, fintech lenders can potentially build credit scores and can expand access to credit to even customers with little or no credit history that are underserved by the traditional banks.

Consistent with this conjecture, the average individual in our sample is a sub-prime borrower with a credit score of 641.11 Moreover, an economically significant 20% of borrowers in our sample do not have a credit score. This is in contrast to the USA, where fintech lenders primarily cater to borrowers who already have access to credit via traditional banks. However, the use of machine learning algorithms combined with big data for credit allocation decisions is not without costs.

Conclusion

In this paper, we have used a unique and proprietary dataset to analyze the impact of the mobile footprint of individual borrowers in predicting loan outcomes. Our dataset comes from a leading fintech lending company in India. We find that the mobile and social footprint

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has significantly more predictive power than traditional credit score used by banks.

We find a number of interesting results. First, we document a statistically and economically significant role of individuals' mobile and social footprint variables in the loan approval process. In the absence of sufficient credit history and credit scores for millennial customers to judge their creditworthiness, the fintech lender uses individuals' mobile footprint as an alternative credit screening process. This is consistent with the wide use of social media-based credit scoring recently adopted by fintech companies worldwide.

We also find that a simple predictive model in which an individual's both crude mobile/social footprint and deeper social footprint based on call logs significantly outperforms a model with a credit score in predicting defaults.

We verify these results using machine learning algorithms that are especially suited for prediction and find qualitatively similar results. Importantly, our counterfactual exercise indicates that evaluating creditworthiness based on social and mobile footprints can potentially expand credit access to the financially excluded borrowers without adversely affecting loan performance.

Overall, our paper underscores the importance of individuals' mobile footprint, and social footprint in predicting consumer loan approval and default prediction. These have wider policy implications as we design new modes of financial intermediation, services, and regulations in the era of 'big data.'

Figure: AUC Plots of Different Machine Learning Models
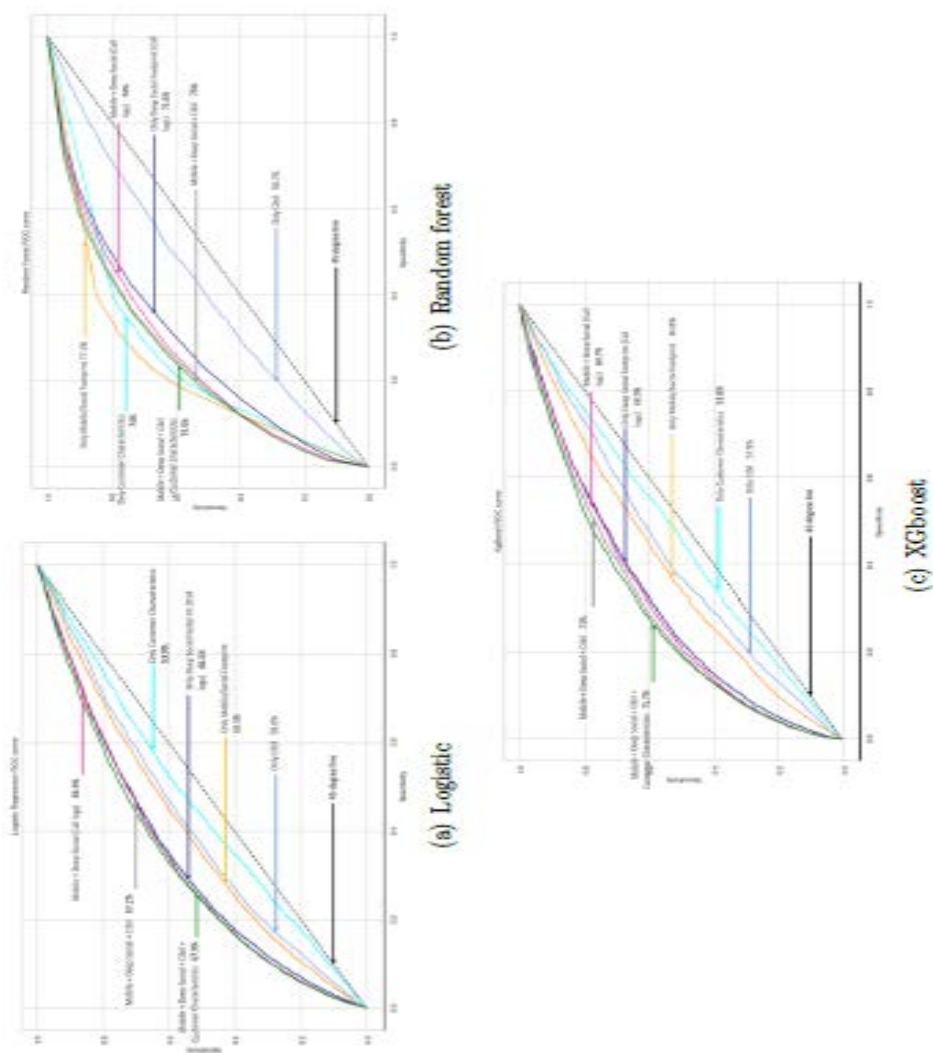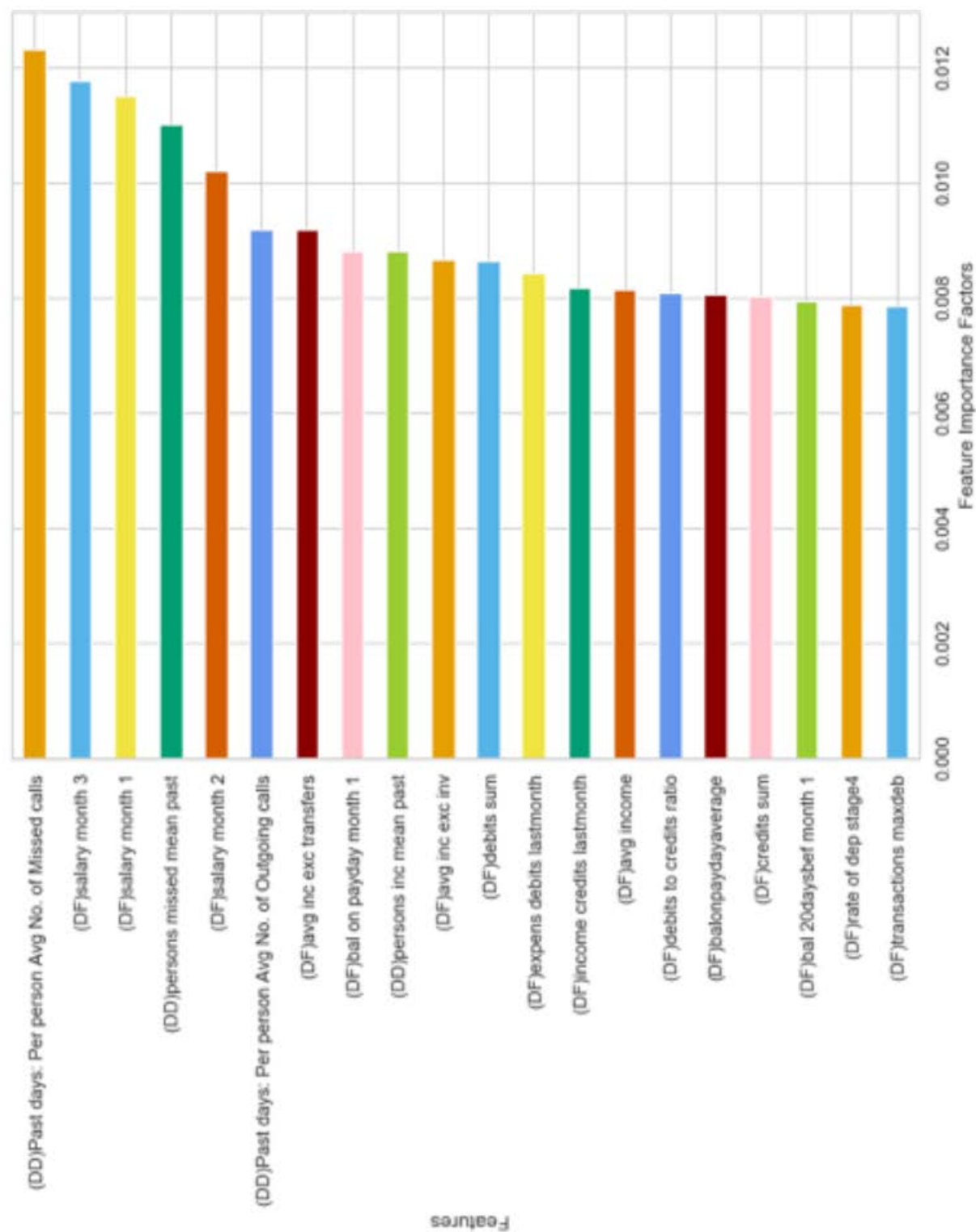

(a) Logistic

(b) Random forest

(c) XGboost

Figure: Variable Importance Factor

Do Social Ties Trump Collateral In Determining Loan Performance? Evidence Using Same Day Loan Repayments

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1. Introduction

The aim of this study is to shed light on the loan repayment rates of households who borrow small sums of money to finance their business or livelihood. These households often borrow loans which are in the range of USD 250 (approx.) for the period of a year. The purpose is to finance household needs like education, health emergencies, repairing house or it could be for investing in their small business like buying a carriage vehicle, replenishing inventory, etc.

Such loans are prevalent in rural areas and low income urban areas. In such settings, it is often difficult to identify good borrowers from the bad ones. Microfinance lenders have relied on social ties between the borrowers to solve this problem of information asymmetry between the borrower and the lender. Borrowers are asked to form groups of typically four to five people, who are often neighbours, and if anyone in the group defaults on their loan, the entire group is held liable. Such a loan contract is called Joint Liability Group (JLG) loan.

However, a recent trend in the Microfinance industry shows a departure from the JLG loans towards the more conventional Individual Liability loans. Under these loan contracts, only the individual who borrows is liable to repay. Such a shift in the industry trends have prompted us to examine these two kinds of loan contracts more closely and evaluate their relative performance. To compare loan repayment performance of JLG (or Group) loans with Individual Liability (or simply Individual) loans, we find a sample of roughly fourteen thousand borrowers who have borrowed both kind of loans simultaneously. We observe that the two loans are sometimes borrowed for same purpose and sometimes for different purposes. One more detail to be noticed here is that most of these loans are to be repaid weekly at the branch office of the lender.

Default on an individual loan may have consequences such as liquidation of the collateral, attachment of other individual property by the bank, negative impact on credit score, and reduction in access to bank finance in future. Default on group loans is likely to have all the above negative consequences except the loss of collateral and other personal property. In addition, default on group loans is likely to adversely impact social ties as other group members have to bear the burden of default due to joint liability. Further, a defaulting group member may lose access to different forms of support such as additional loans, job referrals, and other forms of insurance from the group. Therefore, it is reasonable to hypothesize that the relative performance of the two types of loans depends on which of the two is valued higher by borrowers--individual property pledged as collateral or social ties?

2. Economic Setting

Existing studies such as examine the impact of joint liability within group loans. Crucially, in these studies, both the types of loans being compared are not collateralized. Therefore, a comparison between collateralized individual loans and joint liability based group loans, in terms of their loan performance, is an open question. An apt setting to examine this question is the one where the

same individual is required to repay an individual loan and a group loan at the same time. Such a set up will be able to account for all individual level time variant and invariant characteristics, observable and unobservable to the econometrician, that determine default, and hence, address the concern that group and individual loans are usually given to different types of borrowers.

We use such a set up where the same individual is required to repay a group and an individual loan on the same day and compare the default rates between the two types of loans to determine which of the two types of loan contracts lead to better loan repayment behaviour. We examine the question by using a loan-transaction level data that we obtain from a large non banking finance company (NBFC, henceforth) in India. The major difference between a bank and a non-banking finance company is that the later cannot accept deposits from public whereas the former can. In terms of lending technology, NBFCs are similar to a bank. The NBFC that provided the loan level data operates in three large states of India. The loans that we study are loans made to low income borrowers in rural areas for purposes ranging from agriculture to consumption. The loans are required to be repaid in equated instalments on or before the due date. The lender uses both weekly and monthly repayment frequencies.

Non payment of an instalment in full on or before the due date is defined as default. The lender makes both collateral based individual loans and joint liability based group loans. The bank maintains a separate account for each individual in the group. Therefore, we are able to identify individual default even in group loans. In addition, we have information about time varying borrower level characteristics such as age, income, and expenses and also terms of loan such as loan amount, tenure, and interest rates.

3. Methodology and Results

We start our analysis by examining loan repayment instances where a single borrower has at least one group loan and one individual loan running simultaneously. In other words, every month, the borrower is required to repay instalments on both types of loans. In this sample, we find that the default rate of group loans is lower by 12.57 percentage points.

Next, we tighten the identification further by limiting the sample to loan repayment instances where a borrower is required to repay a group and an individual loan on the same day. Here, group loans out perform individual loans by 10.24 percentage points.

Finally, to address the concern that the loans that always overlap are special, we restrict the sample to cases which satisfy both the below conditions: (i) a single borrower is required to repay a group loan and an individual loan on the same day, and (ii) the group and individual loans have different repayment frequencies so that they do not always overlap. Within these loans, we consider overlapping (same day) loan repayment instances and find that group loans continue to out-preform individual loans by 8.33 percentage points. The out-performance stated above range between 35% to 61% of the average default rate in the sample, and hence, are economically meaningful. We include borrower level and month X year level fixed effects. Thus, we account for borrower level time invariant factors and also the general time trend.

The results hold during periods of economic distress indicating co-insurance at work and relatively more for borrowers with scant hard information, indicating better monitoring by the groups. The out-performance exists even when the collateral on individual loans are relatively easily enforceable. Our results show that social ties are more potent than collateral based lending in enforcing loan contracts.

Our thesis is that the borrowers value social ties more than the possible loss of collateral. The literature on collateral has shown that collateral plays a crucial role in mitigating both ex-ante (information asymmetry between borrowers and lenders) and ex-post (moral hazard) credit market

4. Concerns with the Methodology

We address important concerns relating to our identification strategy and interpretation of results. First, readers may contend that group loans out-perform collateral based individual loans because it is very hard to monitor and enforce collateral in emerging economies and not because borrowers value loss of social ties more than the loss of collateral. Further, it may be argued that, the main result shown in this paper will flip in cases where collateral can be taken over relatively easily by the lender. In other words, the concern is that the out performance of group loans may disappear if the collateral can be easily monitored and enforced.

To test the above concern, we classify individual loans into those with strong and weak collateral. In the tightest specification, we consider only gold as strong collateral and all others as weak collateral. This is because the lender has physical possession of the gold pledged as collateral and therefore can easily liquidate it in case of default. We find that, within an individual borrower, group loans outperform individual loans even in cases where enforcement of collateral is relatively easy. Therefore, our results are not due to weak enforcement of collateral.

There could be a second concern that group and individual loans, even within a borrower, are borrowed for systematically different purposes. Suppose individual loans are borrowed for risky purposes and group loans are borrowed for relatively safe ones, then our results are likely to follow due to difference in purpose and not due to difference in loan contracts. We address the above concern by considering only those borrowers who borrow the individual loan and the group loan for the same purpose. Our data base lists 17 purposes ranging from agriculture to consumption. We find that the group loans outperform individual loans by 9 percentage points in the tightest of the three specifications. For completion, we test and find that our results go through with similar magnitudes even when the purposes are different.

Third, since our main data consists of borrowers having at least one group and one individual loans simultaneously, there could be concerns about selection. To correct for the same, we first obtain data relating to all the loans lent by the lender. We verify that the distributions of the bigger data set and our data set of simultaneous loans are similar in terms of observable borrower characteristics such as age, income, expenses, land holdings, household size, and income. We then apply the Heckman two-step correction model, which treats the problem of selection as an omitted variable bias issue. We show that the coefficient of the inverse mills ratio (the correction for omitted variable) turns out to be statistically insignificant, indicating an absence of selection bias.

5. Mechanism

The results can be explained by either better monitoring, state verification, and enforcement of repayment by groups or by within group mutual insurance or by both the forces working in tandem. While we cannot disentangle the two types of mechanisms, we can test whether mutual insurance and better monitoring have a role to play. To this end, we examine and find that the out-performance of group loans is higher during times of economic stress. Given that the exposure of different group members to economic shocks is likely to be different, it is reasonable to conclude from the above result that group members bail each other out during distress. The result clearly shows that mutual insurance due to joint liability has a role to play in explaining our results. We also find that the out-performance of group loans is higher in cases where the lender has significantly

lower level of hard information about the borrowers, indicating a role for better monitoring and enforcement within the group.

6. Conclusion

A lender's inability to monitor the borrowers led to collateral based lending and the difficulties in enforcing collateral and realizing value that arose mostly in emerging economies, led to group lending with joint liability. Although, these two loan contract types are prevalent in many economies, they have not been compared in terms of their ability to enforce loan repayment discipline. Empirically, such a comparison is difficult as group loans with joint liability and collateral based individual loans are made to different type of individuals in different locations.

We overcome the above identification problem by comparing the loan performance of group and individual loans lent to the same individual and repayable at the same time. We obtain loan transaction level data from a NBFC in India. The data contains instances where an individual is required to repay a group loan and an individual collateral based loan on the same day.

Using the above set up, we find that among such pair of loans, group loans out-perform in terms of default rates. We hypothesize that the strength of social ties trumps enforceability of collateral in its impact on loan performance. Further, the results hold even when collateral on individual loans are relatively easily enforceable. We then examine whether the relative out-performance of group loans changes during times when borrower faces economic distress. If group loans are seen as insurance during times of distress, the out performance should increase. We find that group loans out-perform even more during times of economic distress. The results hold irrespective of the purpose for which the loans are borrowed.

Our findings show that social ties have a stronger impact than collateral in enforcing loan repayment discipline even among borrowers who have access to bank finance. Given the above findings, it is reasonable to infer that group loans play a crucial role in expanding access to finance in emerging economies.

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Rules vs. discretion in market surveillance: evidence from India

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August 29, 2020

Abstract

This paper examines the manner of implementation and the impact of a new surveillance measure, called the Graded Surveillance Measure (GSM) jointly implemented by the Indian securities exchanges and the Securities and Exchange Board of India (SEBI). Unique to the Indian securities market, the measure temporarily restricts trading activity in securities whose prices are not commensurate with the financial health of the firm, as pre-defined by the exchange. Using a unique hand compiled data-set of all the securities that were subjected to this surveillance action, we find that nearly a third of such securities did not satisfy the pre-specified criteria. More than half of the securities that exited the surveillance continued to exhibit the characteristics that subjected them to the restrictions in the first place, raising critical questions on the effectiveness of the measure. We find considerable ambiguity on the extent of trading restrictions imposed on such securities and the manner in which the restrictions are eased or tightened. We also find that securities which are subjected to this surveillance measure, experience a decline in stock prices and trading activity. Our paper contributes to a growing line of literature on the discretion applied by exchanges in surveillance practices and the quality of enforcement of rules.

1 The context

In February 2017, the SEBI and the exchanges jointly introduced the GSM framework aimed at protecting investors by raising alerts on securities witnessing abnormal price rise not commensurate with the financial health and fundamentals of the firm (NSE, 2017). As per the circular published by the NSE, the main objectives of the GSM framework are to:

1. alert and advice investors to be extra cautious while dealing in these securities; and

2. advice market participants to carry out necessary due diligence while dealing in these securities.

Under the GSM framework, stock exchanges regularly monitor and identify securities that are then subjected to special trading rules, which include lower price bands, mandatory physical settlement, Additional Surveillance Deposit (ASD) ranging from 100% to 200% of the trade value and restrictions on the number of days on which the security can be traded (see Table 2). The trading rules to be followed for a security depend upon the stage in which the security is placed. The framework is divided into seven stages, with Stage 6 being the most restrictive. In addition to these trading restrictions, the exchange's circular states that the members trading in the identified securities either on their own account or on behalf of clients shall be kept under close scrutiny by the exchange and any misconduct shall be viewed seriously.

The securities to be included into the GSM framework are identified based on a pre-defined criteria. This criteria is based on certain thresholds for net worth, net fixed assets, P/E or P/B ratio and market capitalisation. Once shortlisted for the GSM, the securities are placed in either Stage 0 or Stage 1 for atleast a quarter. After a quarter, the exchange reviews and updates the list of securities with revised stages, new entries, or exits. The intra-stage movement of securities is determined based on their price movements. If a security does not any longer meet the pre-defined criteria, it is moved out of the GSM framework.

2 Objective

Our paper seeks to evaluate the manner of implementation and impact of the GSM framework on the stocks that are subjected to it.

We first examine how many firms that were shortlisted in the GSM framework met the pre-defined criteria as laid out in the National Stock Exchange (NSE) circular. We evaluate this only at the time of entry and the exit of the stocks, as the criteria for intra-stage movement is based on price movements which is not available in public domain. This helps us determine the extent to which the security selection is done based on rules versus discretion.

Second, we examine the impact of the GSM framework on stock returns and trading activity.

3 Data

Our analysis focuses on publicly available data from the website of the NSE. We begin by compiling the list of securities that entered into the GSM framework over the two year period from March 2017[1] to March 2019.

For this purpose, we hand collect the information on GSM securities from the circulars published on the NSE website under the surveillance and investigation category. Each circular consists of an annexure which lists down the names, trading symbols and ISIN of securities entering, exiting or moving between various stages. Using this information, we curate a dataset of all securities which entered the surveillance mechanism since its introduction in February 2017, along with the date of inclusion, exclusion and movement within stages. We also record the announcement and implementation date for these securities.

We use the Prowess database maintained by the Centre for Monitoring Indian Economy (CMIE) to collect information on the financial and accounting variables for our sample set. Prowess provides information on financial statements, industry groups, ownership data based on the quarterly and annual reports for companies in India. It also provides daily data on financial market variables such as stock prices, floating stock, market capitalization, traded volumes for publicly listed companies. We collect data from Prowess for a period of one year prior to the inclusion of a firm into the GSM framework.

Table 1 gives an overview of our sample period and sample size.

Table 1 Overview of sample

Study period	March 2017-March 2019
No. of stocks that entered GSM	121
No. of unique firms	111
No. of firms suspended from trading	10
No. of stocks that exited GSM	47

During the study period, these 121 stocks experienced various inter-stage movements across the seven stages. Table 2 shows the stage-wise distribution of securities that were placed into GSM during the sample period from March 2017 and March 2019 and the corresponding broad trading restriction.

While a majority of the firms (40%) in the GSM were placed for atleast a quarter in Stage I implying mandatory physical settlement and a price band of 5% or lower, 23% of the firms were placed in Stage 0 in which the system generated a warning every time an order was sought to be placed in respect of these securities. About 17% stayed in Stage II, while about 11% of the firms stayed in Stage III for atleast a quarter. The remaining 9% saw more severe restrictions with trading in such permitted only once a week or once a month, along with an ASD of 200% of the traded value.

4 Research design

To understand the manner in which the GSM framework was implemented, we examine the stocks that were shortlisted in the GSM framework and the extent to which they

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[1] The first list of GSM securities was released in March 2017.

Table 2 Stage-wise distribution of securities in the GSM framework

Stage	Restriction	No. of securities
Stage 0	Market participants are advised to be extra cautious and diligent when dealing in these securities.	55
Stage I	Physical settlement & price band of 5% or lower	96
Stage II	Physical settlement, price band of 5% or lower, ASD of 100%	40
Stage III	Trading permitted once a week, ASD of 100% of trade value	27
Stage IV	Trading permitted once a week, ASD of 200% of trade value	10
Stage V	Trading permitted once a month & ASD of 200% of trade value	7
Stage VI	Trading permitted once a month no upward price movement allowed & ASD of 200% of trade value	4

met the pre-defined criteria as laid out in NSE, 2017. We evaluate the characteristics of these stocks at the time of their entry into and exit from the GSM framework.[2] This helps us determine the extent to which the security selection is done based on rules versus discretion. High discretion in the enforcement of securities market regulation can have unintended consequences on firm liquidity, creates policy uncertainty and has the potential to raise the cost of capital for such firms.

In the second part, we analyse how the inclusion of stocks into GSM impacts a firm's stock price and its liquidity. Given the stringent conditions placed on trading, we expect trading members to reduce their trading activity on the securities placed in the GSM framework. We also expect a deterioration in the stock prices of the GSM firms as a result of inclusion in to the framework. A deterioration is likely to happen since investors would sell such securities given the uncertainty on the tradeability of these stocks. We examine this hypothesis using a difference-in-differences framework.

To eliminate the effect of confounding factors on stock prices and liquidity, we match the firms included in the GSM framework (*treated*) with firms with similar characteristics but not included in the framework (*control*). By comparing these two sets of firms using an event study[3] and difference-in-differences framework, we determine how the GSM framework impacts the stock prices and liquidity of the included firms.

Finally, we examine the stock prices and trading activity of firms that exit the framework.

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[2]We do not examine the characteristics of these stocks during the intra-stage movement as these movements are based on price movements which is not available in public domain.

[3]We conduct the analysis on two event windows: five days and ten days.

5 Findings

5.1 Implementation of the framework

We find that about 30% of our sample firms did not meet the criteria required to be satisfied for the entry into the GSM framework Table **??** summarises our findings.

Stage of entry	Total	Yes	No	n.a.
Stage 0	55	37	9	9
Stage I	56	30	25	1

The last column represents the number of firms for which the data is missing.

We also find that We find that a substantial number of firms that exit the GSM framework continue to exhibit the same characteristics at the time of exit that made them eligible for GSM to begin with. For example, more than half the firms continued to have a net worth that was equal to or less than Rs. 10 crores, net fixed assets equal to or less than Rs. 25 crores and market capitalisation less than or equal to Rs. 25 crores, and more than three-fourth of the exiting firms had a negative PE ratio at the time of their exit.

5.2 Impact on stock prices

Our event study analysis on matched treated and control stocks indicate that securities that enter the GSM framework experience a decline in stock prices after the effective date of entering into Stage 1. On an average, these stocks experience a decline in returns to the extent of 3-5% more than the control stocks. We also find that stocks that enter GSM in Stage 0 do not have significant impacts on stock prices relative to the matched control stocks. This is likely because inclusion into GSM-Stage 0 only generates an alert for the trader to exercise due diligence while trading in such a stock, and does not have any implication in the form of trading restriction(s).

We also analyse the effect on stock prices after a security exits the GSM. We find that on average, these stocks experience significantly positive returns after they exit the framework. This is true for both the five day window, as well as the ten day window. The findings indicate positive investor interest in the stocks after from GSM.

5.3 Impact on liquidity

Further, we examine the impact of the mechanism on the liquidity and trading activity of the stock. To assess the liquidity of the stock, we examine three measures: Amihud's illiquidity ratio[4], traded volumes and number of transactions. While we do not find any effect of the announcement of the inclusion of a stock into the GSM framework, our findings suggest significant impacts on the liquidity of the sto cks after they enter into the GSM framework. Relative to control stocks, we find that the matched treated stocks experience a deterioration in liquidity over a ten-day window (0.13 units on an average).

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[4]The Amihud's illiquidity ratio is a measure of price impact and is calculated as the ratio of daily absolute returns to total trading value (Amihud, 2002).

We find similar impacts on trading activity measures. The average traded volumes as well as the number of trades on matched treated firms fall after they enter into the framework. However, we also observe a decline in traded volumes of the control stocks for the same time period. On the whole, we find that the decline in treated stocks is significantly higher than the control stocks after the first week of entry into the GSM framework. On an average, our estimates suggest a relative decline in average traded volume to the extent of 2,224 shares in the event window of three and five days.

We also find that the illiquidity ratio of the firms that exit the framework improves over the ten day winndow. This finding also holds for trading activity measures of the exited firms.

6 Summary

Our analysis of the framework suggests that there is considerable ambiguity in the manner of selection of firms into the GSM framework. Not all firms that were included in the framework satisfied the pre-defined criteria. Similarly, we find that half the firms that exited the GSM framework continued to exhibit characteristics that subjected them to the restrictions in the first place. This raises critical questions on the efficacy of the mechanism, and also the extent of discretion involved in terms of selecting firms into a framework which has severe consequences.

We also find that securities that are traded in the GSM framework have a significant adverse impact on stock prices as well as liquidity measures. Such impact is likely to raise the cost of capital of firms that enter the framework. If the framework is not well-targeted, then this kind of surveillance action would adversely affect investor confidence (owing to policy uncertainty) as well as the reliance of firms to raise capital on equity markets.

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Algorithmic Traders and Volatility Information Trading
(White Paper)*

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July 26, 2020

1   Introduction

Do algorithmic traders have information on future volatility? Informational role of algorithmic traders has been discussed extensively in the academic literature. Most of the studies suggest that algorithmic traders do not have directional information, but react much faster to publicly available information. Unlike directional information, which is primarily utilized in the spot (cash) or futures market, the options market is uniquely suited for traders with volatility related information. In this paper, we examine whether algorithmic trades in the Indian stock options market have predictive ability for future realized volatility in the spot market.

The benefit of leverage and lower margin requirements suggest that derivative markets are better suited for informed traders. The nature of information that traders use could be either directional or volatility related. In the case of directional information, the trader is supposed to know if the price of a particular security was to go up or down. In case of volatility information, the direction of future price movement is not known to the trader. However, the trader is better informed to predict if the price level is supposed to move from its current level (in either direction).

The last decade has witnessed a significant growth in algorithmic trading activities, not just in developed markets, but also in developing markets. A significant proportion of the order messages received by the exchanges is generated automatically through computers without any real time manual intervention. A subset of these algorithmic traders are known as high-frequency traders (HFT) who use the advantage of speed to bring the round-trip trade execution time down to microseconds. This significant change in dynamics calls for a better understanding of the role of algorithmic traders, especially in derivative markets, where they are more active.

2 Our Study

We try to estimate if any particular trader group has volatility related information while trading in the options market. We use a unique dataset obtained from the National Stock Exchange of India, which provides identifiers for algorithmic trades. NSE is a completely order-driven market with no designated market maker. Due to their non-linear payoff structures, stock options are usually perceived riskier by the less sophisticated (retail) traders. Considering that NSE also has a liquid stock futures market, the stock options market is usually more attractive for algorithmic and other sophisticated traders.

We estimate the volatility demand of algorithmic and non-algorithmic traders and check if this demand has predictive ability for future realized volatility in the spot market. We use six months (Jan-Jun 2015) of intraday data for all 159 stocks which are permitted to be traded in the derivatives market during this period. We use data for both spot and options market to estimate the volatility demand and realized volatility measures. We also further split algorithmic traders into proprietary and agency algorithmic traders and check if they behave differently with respect to trading on volatility related information.

Our primary findings suggest that non-algorithmic traders are informed regarding future volatility while algorithmic traders are not. The options market volatility demand for non-algorithmic traders has predictive ability for future realized volatility in the spot market even after controlling for options implied volatility and other relevant controls. However, the predictive ability of options market volatility demand rarely lasts more than two days into the future. We also find that neither proprietary (who trade in their own account) nor agency (who execute trades on behalf of others) algorithmic traders have volatility related information. We consider both scheduled and unscheduled corporate announcements for periods with higher information asymmetry. Our findings are robust for both these announcement types. We also document the variation in results with respect to different estimates of realized spot market volatility. We also test for the impact of this informativeness on options price changes. We find similar results stating positive relationship between volatility informativeness of non-algorithmic traders and price changes.

3 Volatility Information Trading

Investors with access to private information regarding future volatility are likely to take positions in options contract that are positively related to future realized volatility. Existing research shows that non-market maker's demand for volatility is positively related to future realized volatility. Order-driven markets do not have any designated market maker. Limit orders from various market participants are matched to each other by the exchange matching engine. However, in recent times algorithmic traders, and more specifically HFTs have assumed the role of modern market makers. Unlike the traditional market makers, they are not obliged to provide quotes at all times. As such, it might be expected that the behavior of algorithmic traders should resemble that of traditional market makers, while non-algorithmic traders behave like non-market makers.

Corporate announcements create increase information asymmetry in the market, with market participants with access to private information able to leverage that information earlier compared to others. The situations result in volatility spikes. In periods leading to the corporate announcements, informed investors are likely to use volatility information in the options market. We argue that similar to pre-scheduled earnings announcements, un-

scheduled corporate announcements create similar situations of information asymmetry. As such trading volume of informed investors prior to any corporate announcement should convey additional information.

Algorithmic traders are not expected to homogeneous in their behavior. The motivation for proprietary and agency algorithmic traders are very different. The proprietary algorithmic traders, who primarily engage in high-frequency trading, try to use their advantage of speed to exploit any arbitrage opportunity existing in the market. They are day-traders, who rarely carry over inventory. On the other hand, agency algorithmic traders execute trades on someone else's behalf. Their primary role is to split orders in such a way that the price impact is minimum. They also prevent investors trading on information from the risk of being front-run. As such, the information content of institutional trades may not be present when the trade is executed through algorithms.

Our primary results indicate that the volatility-demand for non-algorithmic traders has positive relation with future realized volatility, indicating non-algorithmic traders are informed regarding future realized-volatility whereas algorithmic traders are not. We also find that volatility information based trading have similar implications with regard to both scheduled and unscheduled announcements. We find that predictive ability of options trading volume is hardly significant beyond two trading days. We split the algorithmic trader group into proprietary algorithmic traders and agency algorithmic traders as these two groups differ fundamentally in the way they employ algorithms. Proprietary algorithmic traders are primarily high-frequency traders who use their advantage of speed to execute a large number of relatively small-sized trades in very small time. Agency algorithmic traders provide trade execution services for other investors. Results indicate that both these trader groups have no prior information regarding future volatility.

4 Price Impact and Information Asymmetry

We further study the informativeness of algorithmic and non-algorithmic traders by inspecting how their demand for volatility is related to option price changes. If a certain group of trader has information regarding future volatility, it is likely that their positive(negative) demand for volatility will be positively related to increase(decrease) in option prices. We estimate this change in option prices through changes in implied volatility. We construct near-the-money options straddles. This combination has high sensitivity to volatility but low sensitivity to directional movements.

Our results indicate that the demand for volatility for the non-algorithmic traders is positively related to change in option prices. However, we do not find information asymmetry as the primary reason behind this results. For both scheduled as well as unscheduled announcements, we do not find incremental increase in information asymmetry. For unscheduled announcements, there is a significant spike on the announcement day. This may be explained by the fact that for earnings announcements, the market already starts incorporating the information prior to the actual announcements. However, due to the unanticipated nature of unscheduled announcements, there is price correction on the announcement date itself. Also, consistent with our earlier analysis, we infer that due to modern electronic markets, the information asymmetry related to earnings announcement has reduced over time.

5   Conclusion

The exponential growth of algorithmic traders in the financial markets demands a better understanding of the role played by these machine traders. A lot of recent literature has been devoted towards their role in the spot market, especially in issues related to the provisioning of liquidity. However, the extent of literature devoted to the role of algorithmic traders in the derivative markets is considerably lesser. We do not find any literature exploring whether algorithmic traders have information regarding future volatility.

We use a large dataset obtained from the National Stock Exchange of India which provides identifiers for trades executed by algorithmic traders. We use six months of intraday data (Jan-Jun 2015) for both stock and options market for 159 stocks to create daily demand for volatility for various trader groups and relate that to future realized volatility in the spot market. We find that non-algorithmic traders are informed about future realized volatility while algorithmic traders are not. We use scheduled earnings announcements as well as unscheduled corporate announcements as exogenous shock. We find that different trader group behave similarly to both these type of events. We also find that the predictive ability of volatility demand for non-algorithmic traders for future realized volatility rarely lasts beyond one trading day.

We further inspect the relationship of this volatility with change in options prices. Instead of using options prices directly, we use the change in implied volatility as a proxy. We find that the volatility demand of non-algorithmic traders is positively related to change in options prices. However, it seems that the price impact is driven more by demand pressure rather than information asymmetry. However, we find slightly different results relative to scheduled and unscheduled corporate announcements, where the information asymmetry seems to be an important issue at least on the unscheduled announcement date. Presently there is more market-wide information dissipation using the electronic platforms which might reduce the overall information asymmetry between various trader groups in general. As such, it might be possible that the market already incorporates the estimated information regards to scheduled corporate announcements such as earnings announcements. However, the same may not be true in case of unscheduled announcements. These findings further strengthen our argument about the volatility informativeness of non-algorithmic traders.

Disclosure and Shareholder Voting: Evidence from India

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April 2020

Abstract

The Companies Act of 2013 in India required material related party transactions (RPTs) be subject to shareholder voting and approval. RPTs are transactions between a firm and a party, either an individual or an equity-holder connected to the directors or managers of the firm. The regulators intended to protect minority shareholders from wealth expropriation through RPTs. Under the new regulation firms are required to disclose detailed information about the proposed transaction. We examine whether the *readability* and *tone* of the RPT disclosure affects shareholder voting on approval of RPTs. Readability is a property of text that captures the simplicity of language and tone captures whether information in text is being presented a biased manner. We find that while readability is not related to voting outcomes, the tone of the disclosure is positively related to both the percentage of investors voting on the resolution and the percentage of institutional investors voting in favour of the resolution. This implies that *how* the managers chose to word the RPT disclosure affects shareholder judgement on voting for the resolution. However, the tone of disclosure is not related to future profitability and the market reactions to the passed resolutions are negatively related to the tone of the disclosure. The means that broader market participants understand the managerial attempt to bias RPT related disclosures and penalize such attempts to manage the messaging. Overall, our evidence highlights the problems that regulators face in improving investor oversight through disclosure and voting. However, our results also should provide confidence to regulators that the broader market has the ability to comprehend message management on part of the managers and markets penalize managers who attempt to bias disclosure.

1. Background and Motivation

Shareholder participation plays an important role in corporate governance, and recent studies show that granting shareholder voting power deters value-destroying corporate actions, such as equity issuance (Chen, Ke and Yang 2013), mergers and acquisitions (Becht, Polo and Rossi 2016) and related party transactions (Li 2018). Around the world, laws and regulations have made shareholder voting mandatory and binding for some important corporate decisions (Iliev et al. 2015). However, it is unclear how investors make voting decisions and what information can help them make an informed decision to support or veto a proposal. Djankov et al. (2008) suggest that mandatory shareholder approval combined with disclosure transparency can have a first-order effect in curbing agency problems and expropriating corporate decisions. In this study, we use a unique setting in India to investigate whether information disclosure on proposed related party transactions (RPTs) affects shareholders' voting, and whether retail investors and institutional investors use the information differently to make voting decisions.

Regulators have long been concerned that corporate insiders can use RPTs to tunnel firms' resources and expropriate wealth from outside investors.[1] In economies where ownership is concentrated and investor protection is weak, RPTs are more likely to present a challenge to regulators. In India regulators made all material RPTs subject to shareholder approval before they can be executed. The Companies Act of 2013 requires material related party transactions (RPTs) to be approved by disinterested shareholders. Accordingly, the Securities and exchange Board of

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[1] Expropriating RPTs can take many forms, such as purchasing goods and service from related parties at prices significantly higher than those in fair transactions, granting corporate loans to controlling shareholders or executives that carry no interest or penalty for non-payment, using corporate assets as a collateral to guarantee insiders' loans from banks or other parties, leasing corporate assets to related parties at minimal cost, etc.

India (SEBI) modified the exchange listing agreement specifying that if a firm's total amount of RPTs with an individual party in a financial year is expected to exceed 10% of the firm's most recent total revenue, then the RPTs with the party will be classified as "material RPTs" and subject to voting by shareholders. The voting is restricted to only "disinterested" shareholders; who are not connected to the related party. Li (2018) shows that the mandatory shareholder voting led to a significant decrease in the volume of RPTs and 7.78% of RPT proposals failed to pass in 2014 and 2015.

In this study we examine the disclosures that are made by the management to the disinterested voting shareholders. Companies proposing to schedule a vote of approval usually disclose the information about the RPTs to shareholders through postal ballot notices or public announcements. We hand collect the postal ballot notices and announcements to examine whether the qualitative disclosure of RPTs is related to investors' voting decisions. *Ex ante*, it is unclear whether the disclosure will affect investors' voting decisions. One scenario is that because the mandatory voting deters expropriating RPTs (Li 2018), insiders will only put the legitimate RPTs to vote, and disclosure is only a sideshow to meet regulatory requirement. In this case, RPT resolutions will pass regardless of the quality of disclosure. The result in Li (2018) that 7.78% RPT resolutions are vetoed suggests that there is a variation in voting outcomes and disclosure may play a role. Alternatively, shareholders may perceive opaque disclosures as a signal of problematic RPTs. In such a case, better quality disclosures will be associated with more shareholders voting in favour of the RPT resolutions.

There is yet another possibility. Firms could intentionally use optimistic language to manage investors' expectations about the RPTs, leading to a positive association between the

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tone of the disclosure and investors' support for the RPTs. However, if investors can unravel the managerial intent behind tone management, the tone of the disclosure may not relate to investors' voting decisions. However, if the tone of disclosure reflects insiders' positive information about increases in future profits and cash flows resulting from value increasing RPTs, a more positive tone of disclosure will be associated with more investor support for the RPTs.

In our final analysis, we recognize that the above discussion assumes that shareholders carefully read the information disclosure on RPTs and make voting decisions based on their reading. Prior studies show that institutional investors and retail investors differ significantly in their ability to acquire and process information. Therefore, we also examine if the impact of disclosure transparency and tone is different for institutional versus retail investors.

2. **Data and Research Methodology**

We hand-collect resolution related information from IIAS Adrian. IIAS is an advisory firm which examines corporate resolutions and provides voting recommendations to institutional investors. Their product, Adrian, provides detailed information on all shareholder resolutions including postal ballot notice, voting recommendation, and voting outcome. We hand-collect postal ballot notices and voting outcome from Adrian. The voting outcome details include information on total number of shares held, number of votes polled, number of votes in favour, number of votes against, separately for institutional shareholders and non-institutional (retail) shareholders.

Using textual information from disclosure on RPTs in the period from 2014 to 2018, we construct two measures of information transparency on RPTs. First, we capture the readability of the disclosure using the fog index, which is indicative of the complexity of language in the

disclosures. The second measure captures the tone of the disclosure and is calculated as the difference between the number of optimistic words and pessimistic words, scaled by the total number of words in the disclosure.

3. Results

Over the sample period, we find that the average tone of the RPT disclosure is stable, but the average fog index increases, suggesting that readability of the disclosure is worsening. On average, 44.28% of eligible shareholders cast votes on a RPT resolution,[2] and the participation rate is much higher for institutions (69.56%) than retail investors (21.04%) of retail investors. The evidence suggests that RPT resolutions are of significant interest to shareholders and draw significant attention from shareholders. 99% of RPT resolutions are passed, and on average, 91.43% of participating institutions vote in favour of the resolutions while 96.68% participating retail investors vote to support the resolutions.

We begin with an analysis of the association between information disclosure of RPTs and investors' participation in the voting on the RPT resolutions. The results from multivariate regressions show that the fog index is not related to the percentage of eligible investors, both institutional and retail, who cast their votes on the RPT resolution. However, we find some weak evidence that the tone of the disclosure is positively related to the participation rate by investors. The evidence seems to suggest that a more positive tone could elicit more shareholder interest in voting.

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[2] These percentages are calculated based on the number of shares, rather than the number of investors. Relevant percentages are defined in the same way in the rest of the paper.

Examining the voting decisions, we find that the fog index is not related to the percentage of voting shareholders who vote in favour of the RPT resolutions, suggesting that the readability of RPT disclosure does not seem to affect investors' voting decisions. In contrast, we find a positive and statistically significant association between the tone of RPT disclosure and the percentage of shares voted in favour of the RPT resolutions. This positive association is driven by votes casted by institutional investors. For retail investors, the tone of disclosure is not related to their shares casted to support the resolutions. The evidence suggests that tone of disclosure has some impact on the voting decision of institutional investors and that a more positive tone is related to more support from institutional investors on the RPT resolutions. However, we don't find that the tone of the disclosure is related to the probability that the RPT resolution is passed, likely because only 1% of RPT resolutions are vetoed and thus there is little variation in voting outcomes.

We proceed to investigate whether the positive association between the tone of the disclosure and institutional investors' support of the resolution is driven by the tone management or the positive information of the managers. To differentiate these two potential explanations, we first examine whether the tone of disclosure is related to future profitability of the firms. If the positive tone reflects managers' positive information, we expect the tone to be positively related to future profitability. Alternatively, since the tone is about the proposed RPTs, RPTs with a more positive tone could reflects managers' optimistic forecasts on the positive effect of the RPTs on future performance, suggesting that future profitability could be positively related to the interaction term between RPTs and the tone. Using Return on Assets (ROA) in year t+1 to measure future profitability, we find neither the tone itself nor the interaction term between the

tone and RPTs are positively related to future profitability. The evidence suggests that the tone of disclosure does not seem to have any information content about future profitability.

Then we examine the market reactions to the voting outcomes of RPTs resolutions. Because vetoed RPT resolutions could be fundamentally different from passed ones, we focus on passed resolutions in the test. To provide clean evidence, we only examine the dates with only one resolution being voted. Using cumulative market-adjusted returns to measure market reactions, we find that the tone of RPT disclosure is negatively related to market reactions and this association is statistically significant at 1% level. This result is obtained after we control for the amount of RPT and a number of firm characteristics. The evidence suggests that investors do not perceive a positive tone to be a positive signal about future performance. Instead, investors seem to react more negatively to a positive tone of the RPT disclosure, implying they are able unravel the tone management.

4. Contributions and Conclusion

The results of our study are of interest to academia, regulators, and investors. First, the study of interest to those who are interested in knowing more about the linkage between shareholder voting and the role of managerial disclosures. While prior studies find that granting shareholder voting power deters value-destroying corporate actions and improving firm value (e.g., Chen, Ke and Yang 2013; Becht, Polo and Rossi 2016; Li 2018), we are the first to directly examine the effect of information disclosure in shareholders' voting decisions. As Djankov et al., (2008) suggest, mandatory shareholder approval must work together with disclosure transparency to be effective in constrain expropriation by controlling shareholders and corporate insiders. Our results show that information disclosure does have some effect on shareholders'

voting decisions and particularly the tone of disclosure seems to be related to more shareholders participating in the voting and voting in favour of the resolution. This result is important for regulators and shareholders, as our analysis suggests that the tone of the disclosure could be managed by corporate insiders to obtain the voting outcomes that they desire.

Second, the study has important implications for regulators who are interested in promoting better corporate governance and creating well-functioning markets where investors can invest with confidence. While many RPTs are legitimate transactions that facilitate firms' operations, corporate insiders can structure RPTs to expropriate wealth from the firm and disadvantaging minority shareholders. This is particularly a concern in emerging markets such as India where investor protection is relatively weak and controlling shareholders and promoters are dominant. In India, the 2013 Securities Act and the rule issued by SEBI empower shareholders to vote on RPTs, which deter expropriating RPTs (Li 2018). Our results show that the regulation also has some unintended effects, such as decrease in the readability of disclosure over time and tone management to influence voting outcomes. These results provide caution to regulators and investors when examining firms' RPT disclosure before voting takes place. Our study's results imply that regulators and investors should watch out for language and tone management by managers in the disclosures about the RPTs. However, the good news is that the markets more broadly are able to unravel these disclosure strategies pursued by managers.

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TEXTUAL DISCLOSURES AND RETAIL INVESTORS

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INTRODUCTION

Prior evidence suggests that textual disclosures provide incremental information to investors as all value-relevant information cannot be presented in financial statements (Davis, Piger, and Sedor 2012; Li 2010). However, there is no formal external auditing requirement for these disclosures, and it is difficult to regulate them (Cazier, Merkley, and Treu 2019). Thus, managers often mislead investors by increasing the complexity of the annual reports when the performance is poor (Li 2008) or strategically employing overly optimistic or pessimistic tone around important corporate events (Huang, Teoh, and Zhang 2014). The experimental evidence from Tan, Wang, and Zhou (2014) suggests that less sophisticated investors are more susceptible to the framing effects of language. The current study empirically examines how less-sophisticated investors interpret textual information.

Most of the early evidence on the behavior of retail investors show that retail investors are unsophisticated, behaviorally biased, and otherwise uninformed. They show that retail investors have lower ability to process information as compared to institutional investors (Tan, Wang, and Zhou 2014) and that they are more likely to be influenced by the poor readability of textual disclosures (Lawrence 2013). Thus, retail investors could make poor investment decisions by misinterpreting textual disclosures. However, the view that retail investors are unsophisticated and noise traders has been challenged by recent findings. Retail investors vastly outnumber institutions. They are not homogenous and some of them could be informed. Kelley and Tetlock (2013 & 2016) argue that retail investors may have unique information about the firm either from geographical proximity, relationships with employers, or additional insights into customer tastes. Moreover, unlike

institutional investors, retail investors do not suffer from principal-agent problems. Thus, it is possible that some retail investors are not prone to the framing effects of language. Therefore, it is not clear ex-ante if retail investors are influenced by the language of textual disclosures.

Prior studies examining the trading of retail investors have employed data either from a single broker or used an indirect proxy. Lawrence (2013) employs data on the trades and portfolio positions of individual investors from a single broker for the period 1994 to 1996. Baginski, Demers, Kausar, and Yu (2018) use the trade size as a proxy for small investors. These proxies could lead to biased inferences about the population of retail investors (Kelley and Tetlock 2013). This concern is motivated by the fact that large investors split their orders into smaller trades (Loughran 2018), and therefore employing trade size to proxy investor category could lead to misclassification of traders. We use unique transaction-level data from the stock market in India that enables us to employ a much cleaner investors' classification scheme.

DATA AND SAMPLE CONSTRUCTION

We analyze earnings conference call transcripts to capture textual disclosures as they are one of the most important avenues through which the management communicates significant information to investors (Brown, Call, Clement, and Sharp 2017; Li, Minnis, Nagar, and Rajan 2014; Frankel, Mayew, and Sun 2010). Although conference calls are voluntary in India, the number of Indian companies hosting these calls has risen significantly in recent years.[4] The Indian capital market regulator, Securities and Exchange Board of India (SEBI), mandates the disclosure of conference call transcripts to the public.[5] We obtain the transcripts of earnings conference calls from ProwessIQ, Capital IQ, and Researchbyte[6] website. We focus on those firms which were part of the S&P BSE 500 index during the period 2004 to 2019. We collect accounting and daily stock trading data from Prowessdx.

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[4] "*Number of companies hosting earnings calls rises by 40% in five years to FY18*" – By Kiran Kabtta Somvanshi, Economic Times (November 27, 2018). (Link: https://economictimes.indiatimes.com/markets/stocks/news/number-of-companies-hosting-earnings-calls-rises-by-40-in-fy18/articleshow/66820555.cms?from=mdr)
[5] Provisions of Regulation 30 of Listing Obligations and Disclosure Requirements Regulations, 2015
[6] Researchbyte (Link: https://www.researchbytes.com/) is one of leading websites that provides information on annual reports, earnings conference calls, management interviews, and investor presentations for Indian companies.

Additionally, we employ a rich tick-by-tick transaction data from the Bombay Stock Exchange (BSE)[7] in India. The dataset has all orders and trades during the period from January, 2009 to March, 2016. It also contains the categories of traders and their masked identity. This allows us to identify trades of different categories of investors easily. We combine this transaction-level data with the earnings conference call data.

We count the frequency of optimistic and pessimistic words in earnings conference call transcripts by employing a financial dictionary of optimistic and pessimistic words from Loughran and McDonald (2011).[8] We define *TONE* as the difference between the count of optimistic words and pessimistic words and scale it by the total count of optimistic words and pessimistic words.

There are 8,273 quarterly earnings conference call transcripts from 559 unique firms during the period 2004 to 2019. We find that on average there are 7,032 words in the earnings conference call transcripts out of which 80 words are optimistic and 86 words are pessimistic. Thus, *TONE* on average is pessimistic (negative).

RESULTS

We start by examining if *TONE* contains some information about future operating performance. As firms' performance cannot be completely captured by the quantitative disclosures in the financial statements, managers could employ *TONE* to provide a signal of future firms' performance (Davis, Piger, and Sedor 2012; Li 2010). However, Huang, Teoh, and Zhang (2014) provide strong evidence that managers strategically employ *TONE* to mislead investors. We analyze the association of *TONE* with future earnings and sales growth and find that *TONE* is negatively associated with future earnings in the next quarters. The negative association is both statistically significant and economically meaningful. Specifically, we find that when *TONE* increases from 25th percentile to 75th percentile, next quarter's earnings decreases by 5.7 percent of its average value. Similarly, we find that more optimistic *TONE* in the current quarter predicts lower sales growth in the next quarter. This evidence suggests that managers use optimistic *TONE* to obfuscate poor future performance.

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[7] The Bombay Stock Exchange (BSE) is the world's tenth-largest stock exchange in terms of market capitalization.
[8] This financial dictionary contains 354 optimistic words (e.g. "*achieve*", "*benefit*", "*enhance*") and 2,355 pessimistic words (e.g. "*adverse*", "*damage*").

Next, we investigate how investors react to *TONE* by looking at the stock price changes around the earnings conference call disclosure date. We calculate abnormal returns as the difference between daily stock returns from Prowess and market returns. We use the S&P BSE 200 returns as a proxy for market returns. We calculate cumulative abnormal returns (*CAR*) across the three short-term windows *[-1, +1]*, *[-1, +3]*, and *[-1, +5]* where 0 is the date when the conference call transcripts are made available to investors. We find a positive association between *TONE* and *CAR*, which is statistically significant at the 1 percent level. Specifically, we find that as *TONE* increases from 25th percentile to 75th percentile, *CAR [-1, +1]* increases by 1.4 percent. Thus, the association is also economically meaningful. Thus, investors react positively to optimistic *TONE*. While *TONE* does not predict positive future operating performance, it predicts positive stock returns in the short-window around the earnings conference calls. This finding suggests that investors are misled by *TONE*.

Finally, we analyze the trading activities of retail investors separately. We are interested to know if retail investors are the net buyers or the net sellers when *TONE* is more optimistic. We identify all the trades executed by the retail investors from the BSE tick-by-tick dataset. If retail investors are misled by *TONE* of the earnings conference call, then we should expect retail investors to be net buyers of the stock when *TONE* is more optimistic. However, we find that retail investors are net sellers of the stocks when managers employ more optimistic *TONE*. Furthermore, we find that large non-institutional investors' ownership decreases when *TONE* is more optimistic while there is no effect on small non-institutional investors' ownership. This evidence suggest that the large retail investors may not be misled by *TONE*. Further research should investigate the different trading behavior of small and large retail investors.

CONCLUSION

Most of the early evidence on the behavior of retail investors show that retail investors are unsophisticated, behaviorally biased, and otherwise uninformed. Using rich and transaction-level data from the stock market, we examine how retail investors react to textual information which is a noisy signal about firm fundamentals. Our evidence suggests that the managers use linguistic tone in the earnings conference call to mislead investors by obfuscating future poor performance. However, the average retail investor is not necessarily misled. Further research could examine the different trading behavior of small and large retail investors.